CLAIMS

What is claimed is:

1. A method for determining a mass of a pollutant in an emissions sample obtained from a particular vehicle, comprising the steps of:

extracting the emissions sample from the particular vehicle as it is operated over a testing period comprised of one or more discrete time intervals;

determining instantaneous fuel consumption of the particular vehicle;

calculating an exhaust flow rate based on the instantaneous fuel consumption of the particular vehicle at each discrete time interval;

analyzing the emissions sample extracted from the particular vehicle to measure the concentration of the pollutant in said sample at each discrete time interval; and

determining the mass of the pollutant at each discrete time interval by multiplying the exhaust flow rate by the measured concentration of the pollutant by a known density of the pollutant.

2. The method as recited in claim 1, and further comprising the steps of:

plotting the mass of the pollutant over the testing period to generate an emission profile; and

integrating the emission profile over the testing period to determine a total mass of the pollutant.

3. The method as recited in claim 2, and further comprising the steps of:

dividing the total mass of the pollutant by the distance traveled over the testing period to calculate a test score for the pollutant; and

comparing said test score against a defined standard, wherein a test score exceeding the defined standard is considered a failure.

4. The method as recited in claim 1, in which determining instantaneous fuel consumption of the particular vehicle comprises the following sub-steps:

measuring a velocity and an acceleration rate of the particular vehicle;

calculating a total drive wheel power demand at each discrete time interval of the testing period based on the velocity, the acceleration rate, and certain physical characteristics of the particular vehicle;

determining an engine load and an engine speed as a function of the total drive wheel power demand; and

estimating the instantaneous fuel consumption of the particular vehicle using a representative engine map relating fuel consumption to engine load and engine speed.

5. The method as recited in claim 4, in which the calculation of the exhaust flow rate based on the instantaneous fuel consumption of the particular vehicle is premised on an assumed combustion of fuel with a stoichiometric air-fuel ratio.

6. The method as recited in claim 1, in which said representative engine map is a generic engine map constructed by blending several representative engine maps together.

7. The method as recited in claim 1, in which said representative engine map is re-sized to match the displacement of the particular vehicle.

8. The method as recited in claim 6, in which said representative engine map is re-sized to match the displacement of the particular vehicle.

9. The method as recited in claim 1, in which the extraction and analysis of the emissions sample from the particular vehicle is accomplished by:

a narrow sample probe for insertion into the tailpipe of the particular vehicle;

a sampling line operably connected to said sample probe; and

an analyzer for detection of the pollutant associated with and in gaseous communication with a sample and calibration gas control system, said control system being operably connected to the sampling line.

10. The method as recited in claim 1, in which the extraction and analysis of the emissions sample from the particular vehicle is accomplished by a remote sensing device.

11. The method as recited in claim 1, in which the extraction and analysis of the emissions sample from the particular vehicle is accomplished by on-board analyzers plumbed directly into the exhaust system of the particular vehicle.

12. A method for determining a mass of a pollutant in an emissions sample obtained from a particular vehicle, comprising the steps of:

measuring a velocity and an acceleration rate of the particular vehicle over a testing period comprised of one or more discrete time intervals;

measuring a concentration of the pollutant in the emissions sample at each discrete time interval;

determining an engine load and an engine speed based on the velocity, the acceleration rate, and certain physical characteristics of the particular vehicle;

determining instantaneous fuel consumption of the particular vehicle;

calculating an exhaust flow rate based on the instantaneous fuel consumption of the particular vehicle at each discrete time interval; and

converting measured pollutant concentration into pollutant mass at each discrete time interval by multiplying the exhaust flow rate by the measured concentration of the pollutant by a known density of the pollutant.

13. The method as recited in claim 12, and further comprising the sub-step of calculating a total drive wheel power demand at each discrete time interval based on the velocity, the acceleration rate and said certain physical characteristics of the particular vehicle, such that the engine load and engine speed can be determined as a function of the total drive wheel power demand.

14. The method as recited in claim 12, and further comprising the steps of:

plotting the mass of the pollutant over the testing period to generate an emission profile; and

integrating the emission profile over the testing period to determine a total mass of the pollutant.

15. The method as recited in claim 14, and further comprising the steps of:

dividing the total mass of the pollutant by the distance traveled over the testing period to calculate a test score for the pollutant; and

comparing said test score against a defined standard, wherein a test score exceeding the defined standard is considered a failure.

16. The method as recited in claim 12 in which the calculation of the exhaust flow rate based on the instantaneous fuel consumption of the particular vehicle is premised on an assumed combustion of fuel with a stoichiometric air-fuel ratio.

17. The method as recited in claim 12, in which measuring the concentration of the pollutant in the emissions sample is accomplished by:

a narrow sample probe for insertion into the tailpipe of the particular vehicle;

a sampling line operably connected to said sample probe; and

an analyzer for detection of the pollutant associated with and in gaseous communication with a sample and calibration gas control system, said control system being operably connected to the sampling line.

18. The method as recited in claim 12, in which measuring the concentration of the pollutant in the emissions sample is accomplished by a remote sensing device.

19. The method as recited in claim 2, in which measuring the concentration of the pollutant in the emissions sample is accomplished by: on-board analyzers plumbed directly into the exhaust system of the particular vehicle.